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Artificial Intelligence in the **Utilities Sector**

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Table of Contents

Artificial Intelligence in the Utilities Sector

Artificial Intelligence (AI)/Machine Learning (ML) applications are increasingly integral parts of businesses' operational development, enhanced customer experience, and overall process optimization. In some industries, AI/ML technology is a defining aspect of the services and products offered, putting companies that use AI/ML at the forefront of their respective fields.

Utilities and the energy sector as a whole are increasingly, albeit slowly, adopting AI in their daily operations and in turn reaching their business goals and achieving greater levels of efficiency, reliability, and security. The slow integration of AI/ML in the utility sector in particular is most likely caused by the challenges that AI/ML imposes. AI/ML is still a mystery to many. Zpryme surveyed 100 utilities on AI/ML applications in their organizations. The results show that utilities are overall interested but many are still reluctant to invest in AI/ML applications. There are still concerns about the challenges that AI/ML bring to their organizations and the ways they could bring value to their business operations. However, AI is increasingly recognized as a necessity for its potential to deliver services with speed and accuracy, detect defects and security breaches, optimize customer engagement, accelerate DER integration into the grid, and balance the supply and demand of the grid.

Key Findings

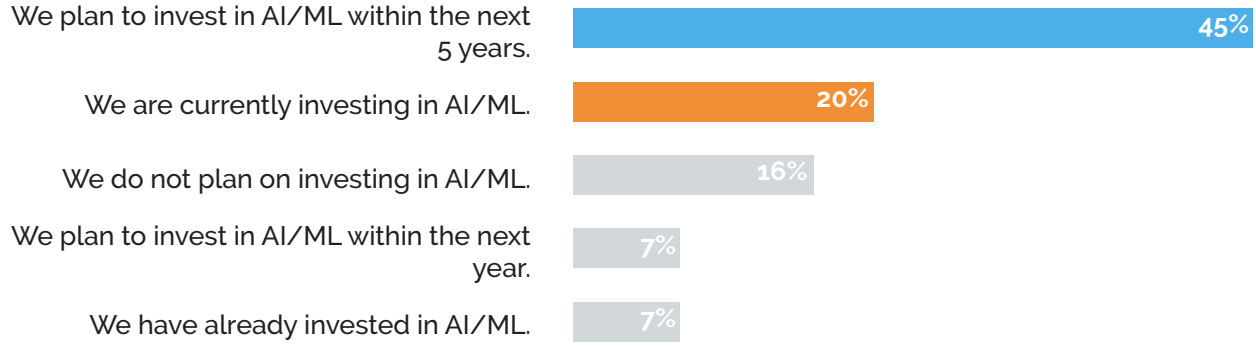
- 45% of utilities have AI/ML implementations as part of their 5 year plan.
- Customer service optimization is top of mind for utilities, as 58% and 54% said AI applications would bring faster response times to maintenance requests and enhanced customer experience respectively to their organizations.
- 59% reported that cost is the biggest challenge for AI/ML implementation.
- 41% are implementing AI applications for cybersecurity.

AI/ML and organizational readiness

AI and ML tools can add value by optimizing processes, accurately detecting issues and faults in the system, personalizing customer experience, test power flow and quality, and provide overall speed and accuracy.

Figure 1

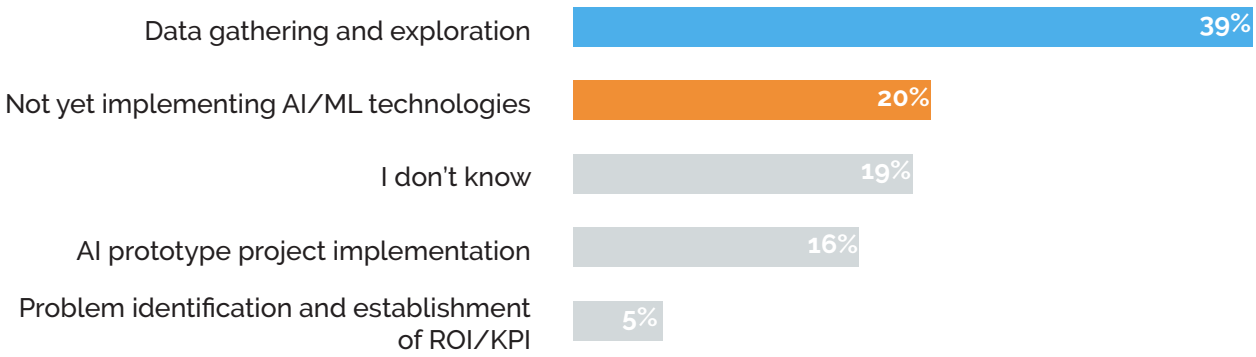
Plans for investing in AI/ML within the next five years:



There is a strong appeal to AI/ML technologies and their benefits are numerous to both the business and the consumer. And the recent push to remote work and the increasing need to conduct business remotely has created an additional incentive for utilities to consider investing in AI technologies. When asked about their plans to invest in AI/ML technologies, 45% of utilities are planning to invest in AI/ML technologies in their organizations within the next 5 years. Whereas, only 20% said they are currently investing in AI/ML technologies (Figure 1).

Figure 2

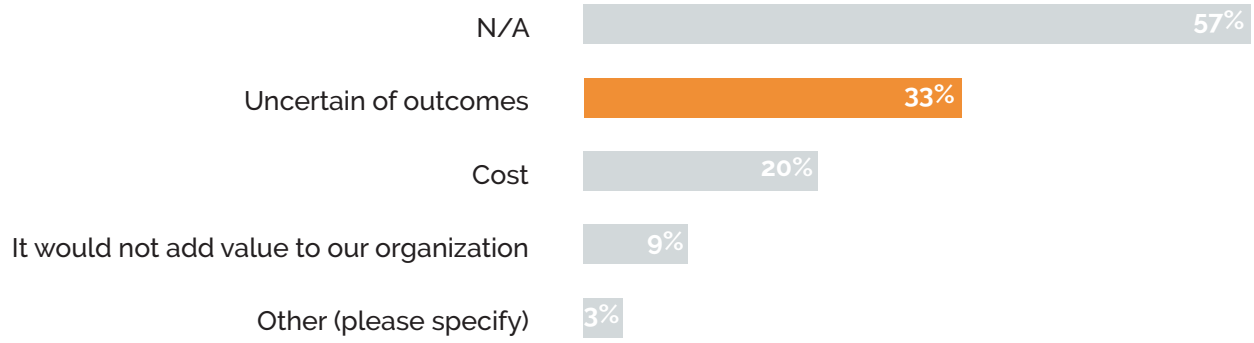
At what stage of AI/ML implementation is your organization?



Those who are investing in AI/ML in their organizations are mostly in the data gathering and exploration phase of their implementation process (39%), while 16% are in the prototype project implementation phase (Figure 2).

Figure 3

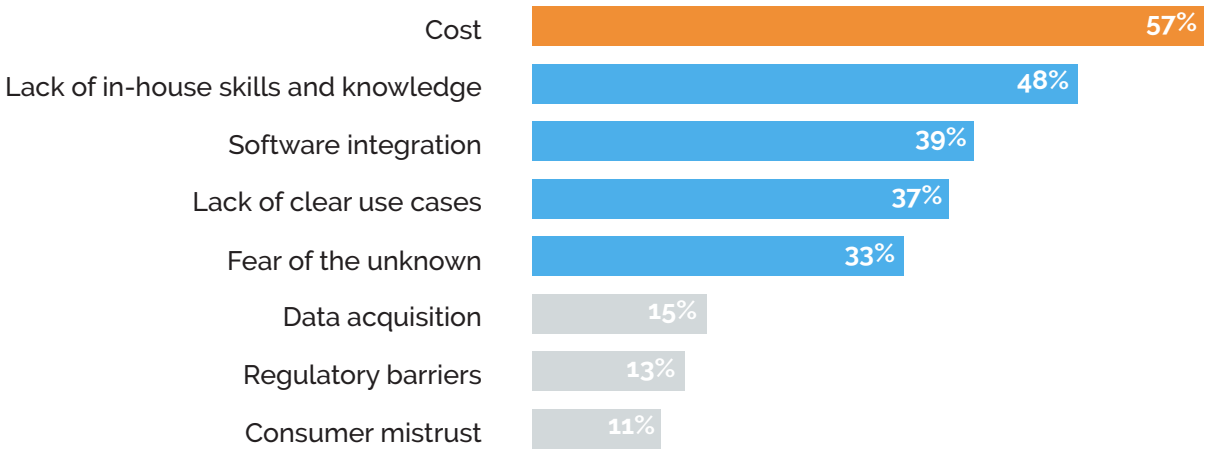
Main deterrence against investing in AI/ML technologies:



Utilities are overall very interested in AI/ML implementation in their organizations. However, while AI/ML tools may have very strong potentials in the utility sector, they also pose certain challenges. Utilities must be prepared to implement and manage artificial intelligence tools before implementation. Utilities that are not considering investing in AI/ML were asked about their reluctance to invest in AI/ML. Respondents said they are mainly skeptical about AI/ML applications and the results they would bring to their organizations (33%). And as is typically the case with advanced technological investments, cost presents a major concern when considering AI/ML technology. 20% of respondents said cost is a major impediment to investing in AI/ML (Figure 3).

Figure 4

Biggest challenges to investing and adopting AI/ML:



AI/ML technologies and their powerful impact in automating customer protection and service, optimizing customer engagement, balancing the grid, and DER integration are appealing and becoming increasingly integral to utilities committed to resilience and reliability in their services. However, implementing new technologies comes with its own set of concerns specific to the utility sector, as the services they provide are vital. Upgrading to new technologies is not only costly but likely means running into compatibility issues with legacy devices, applications, and protocols. Thus, interruption in operations may result in the implementation process, which could be not only costly but impossible for some service providers. 59% reported cost as the biggest challenge to investing in and adopting AI/ML. Following are lack of in-house skills and knowledge and software integration are also major challenges, 48% and 39% respectively. Interestingly, 37% said that lack of clear use cases is a big challenge (Figure 4). Meaning many are still uncertain about how AI/ML could benefit their organizations.

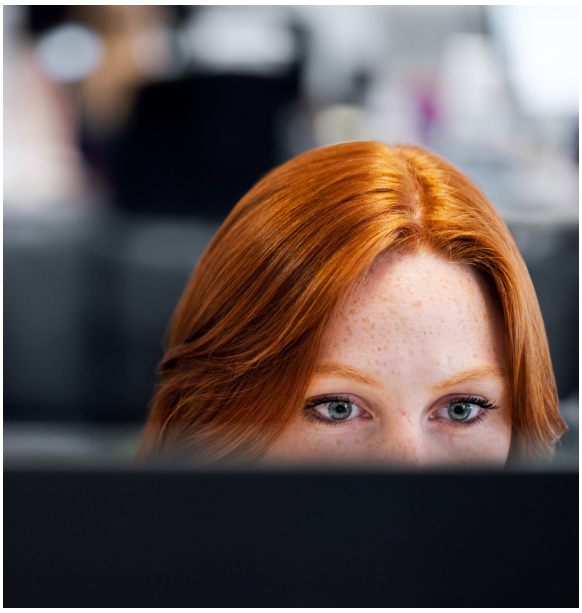
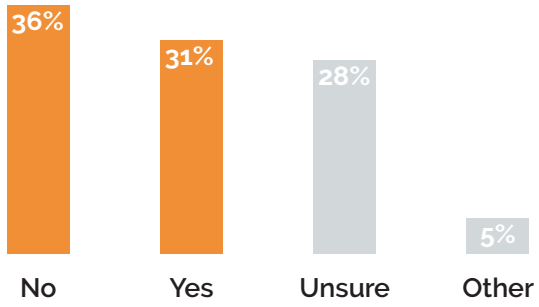


Figure 5

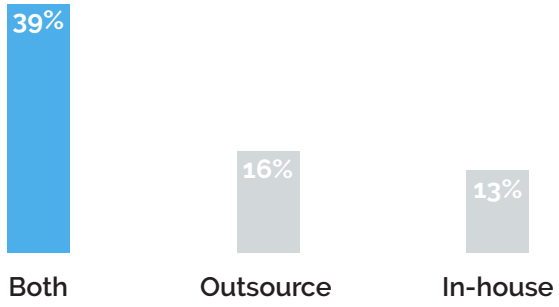
Do you have the skilled personnel & tools in your organization to implement and manage AI technologies?



36% of respondents said their organization's lack the skilled personnel and tools to implement and manage AI technologies. 31% said they do have the skilled personnel and tools to implement and manage AI technologies in their organizations. 28% answered "I don't know" (Figure 5), indicating a lack of communication around AI implementation processes in those organizations.

Figure 6

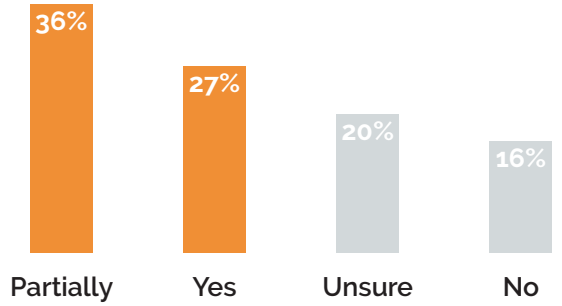
Insourcing & outsourcing AI initiatives:



39% of respondents said their organizations use a mixture of in-house and outsourced personnel and tools to manage their AI initiatives. On the other hand, 16% said they only outsource AI and 13% said they only use in-house personnel and tools (Figure 6).

Figure 7

Do you believe processes in your organization can be fully automated with the use of AI?



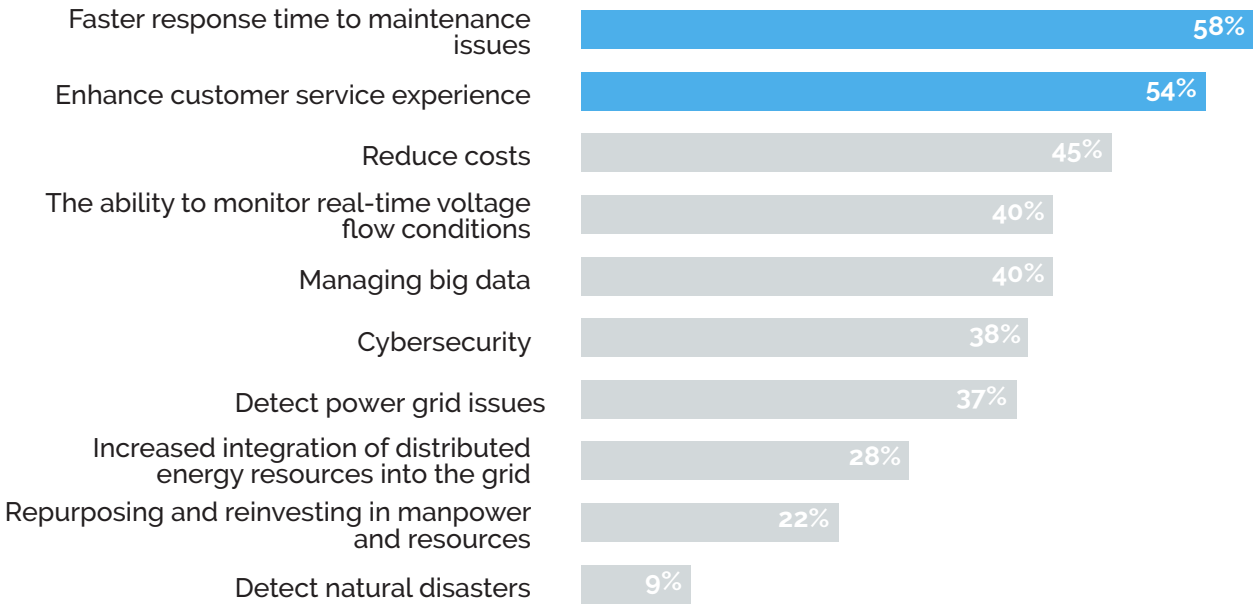
Utilities are wary of full automation at their organization. The vitality of their services makes it impossible to leave processes and operations completely automated. AI capabilities are not without limits and cannot be relied upon entirely. When asked whether they believed processes could be fully automated with the use of AI, 36% of respondents said that processes can only be partially automated with AI, while 27% see AI's full potential to fully automate processes (Figure 7).

AI and customer service

Additionally, the data suggests overall customer experience enhancement is the most valuable outcome from AI applications. A positive customer experience is often the marker of a highly successful organization and AI has great capabilities at enhancing and optimizing the customer service aspect of any organization. AI's impact on customer experience has been realized by many global organizations that have a reputation for unique customizable customer experiences. And customers' expectations for a customized and digitized engagement from their utilities are influenced by the level of a fully digital customer service that is offered in many large businesses.

Figure 8

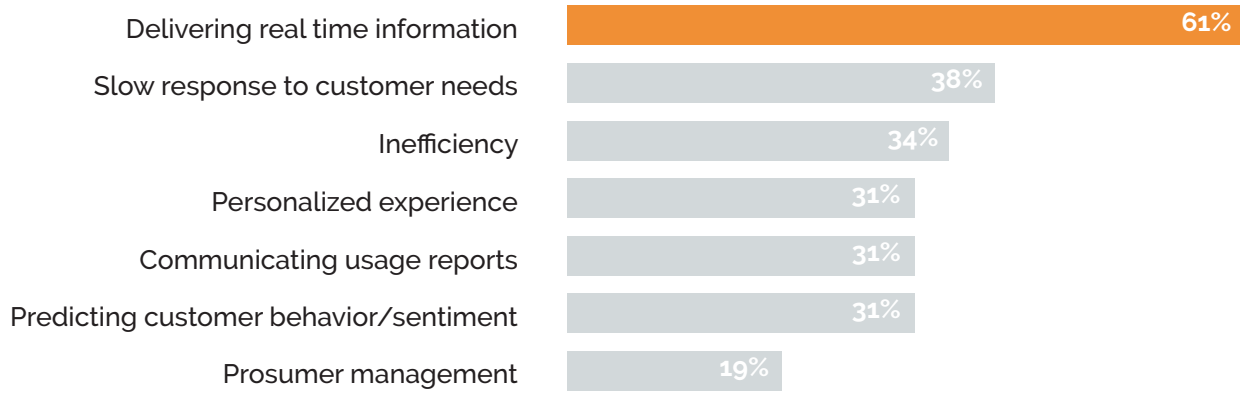
Biggest values of AI applications:



When it comes to areas where AI could be implemented, respondents believe that AI could bring the most value in customer service. 58% and 54% believe that it could optimize response time to maintenance issues and enhance customer experience, respectively. Followed by cost reduction (45%), real-time monitoring of voltage flow (40%), and managing big data (40%) (Figure 8). The data indicates that utilities recognize the importance of customer satisfaction and how it impacts their businesses even when they are highly regulated.

Figure 9

Areas of customer engagement that are best addressed using AI/ML:



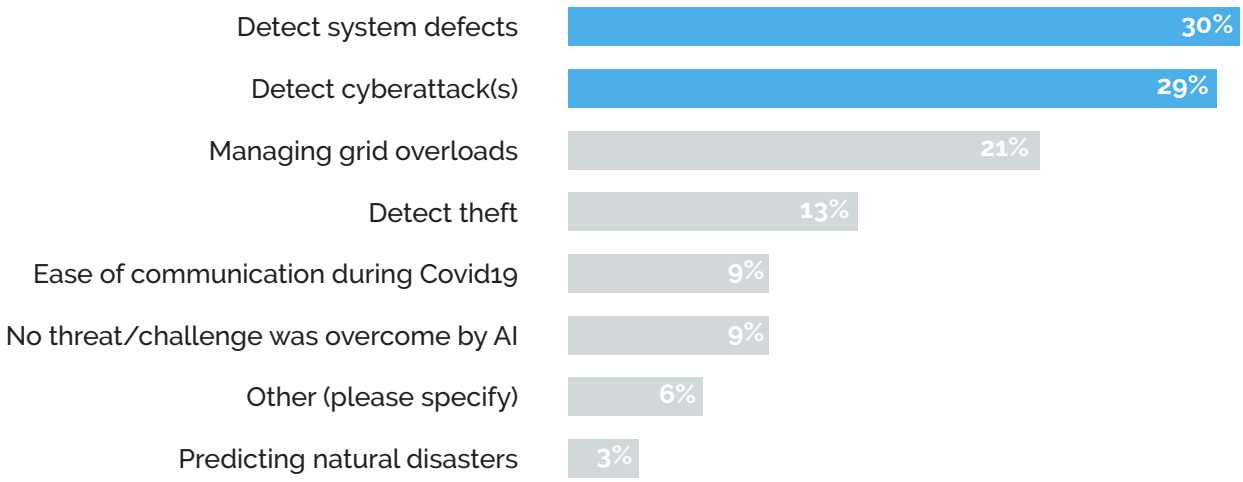
Delivering real-time information to customers is the most important area of customer engagement that utilities want to address with the use of AI technologies (61%). Followed by slow response to customers' needs (38%) and inefficiency (34%) (Figure 9).

AI and safety and security

A cyberattack on a utility service provider could have serious consequences. The increasing digital transformation in the utility enterprise, and the increasing shift to smart grid-connected devices that have a steady flow of data between the utility and consumer are making utilities and the grid more vulnerable to cyber threats. In any case, a cyberattack will compromise a utility's core mission of achieving reliability and resilience. Implementing the right cybersecurity and network security tools and investing in the manpower and technology is a major concern for utilities. Implementing AI tools will harness the power of the massive data that utilities collect and immediately and automatically detect any threats or abnormalities in the network.

Figure 10

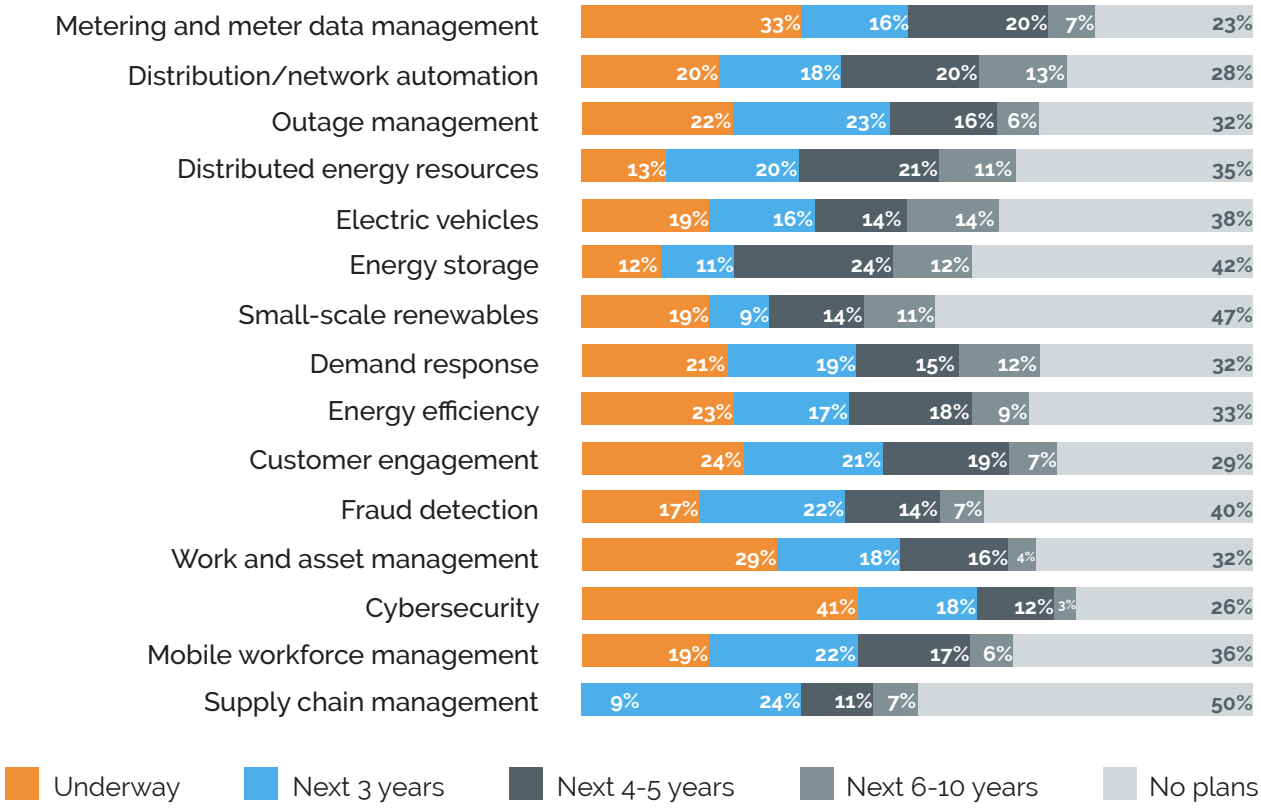
Ways AI has been the most useful in enhancing safety & security over the past three years:



AI tools are commonly used for safety and security by analyzing historical and new data and detecting defects and abnormalities in networks, systems, and operations in an organization. Indeed, when asked about the area where AI has been implemented 30% said AI has been most useful in detecting system defects. 29% said AI has been most useful in detecting cyberattacks. Followed by managing grid overloads (21%) (Figure 10).

Figure 11

Plans for AI supported programs and applications :



Network security is top-of-mind for utilities. Of the myriad uses and applications of AI, cybersecurity seems to be at the top for utilities, as 41% of utilities have plans underway for AI supported cybersecurity programs and applications. Whereas 33% said they're implementing AI for metering and meter data management (Figure 11).

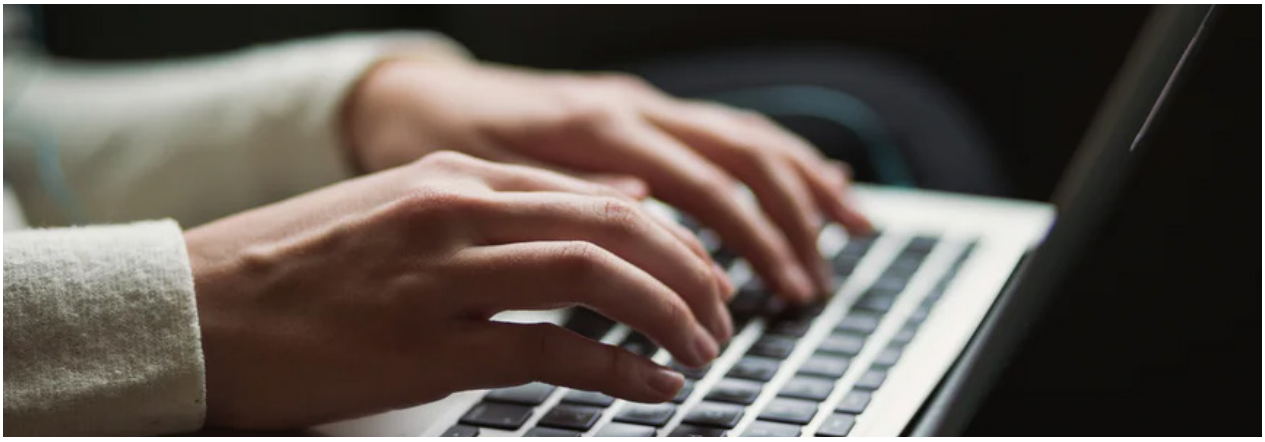
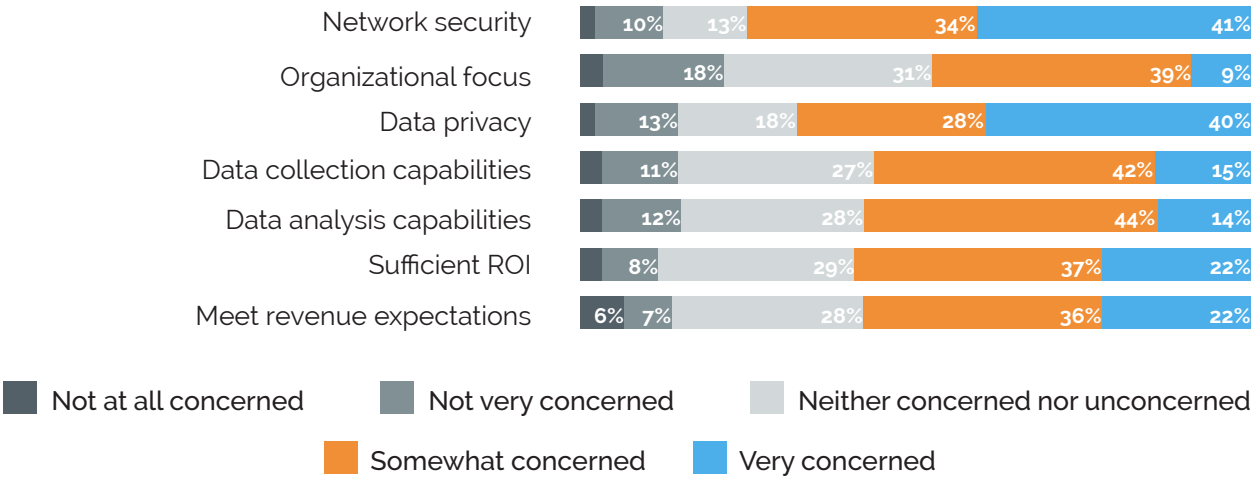


Figure 12

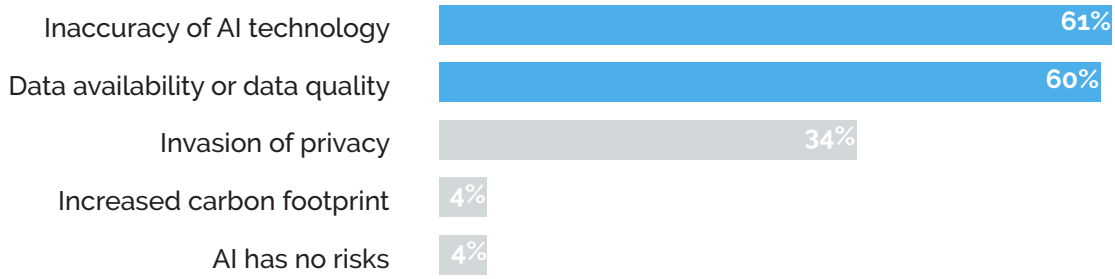
Biggest concerns regarding AI technologies and investments:



AI technology is relatively new and with the tremendous amount of data that it processes from different sources and the fact that AI is a cloud based platform many utilities have concerns about AI's security and data privacy. When we asked utility companies about their biggest concerns with AI technologies and investments 41% said they are very concerned about network security and 40% are very concerned about data privacy, continuing the trends from the previous data. 44% and 42% said they are somewhat concerned about data analysis and data collection capabilities, respectively (Figure 12).

Figure 13

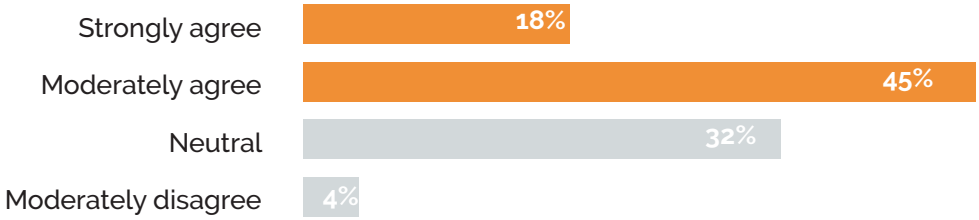
Risks of implementing AI technologies:



AI operates by analyzing massive amounts of data. It recognizes patterns and further learns from data collected over time. And the longer AI tools have been collecting data, the better the quality of the data, which in turn means better outcomes from those tools. Unsurprisingly then, when asked about their opinion on the biggest risk of implementing AI technologies 61% of surveyed utilities said Inaccuracy of AI technology and 60% data availability or quality are the biggest risks of AI technology (Figure 13).

Figure 14

Do you agree with the following statement: "AI/ML technology is beneficial to enhancing overall safety?"



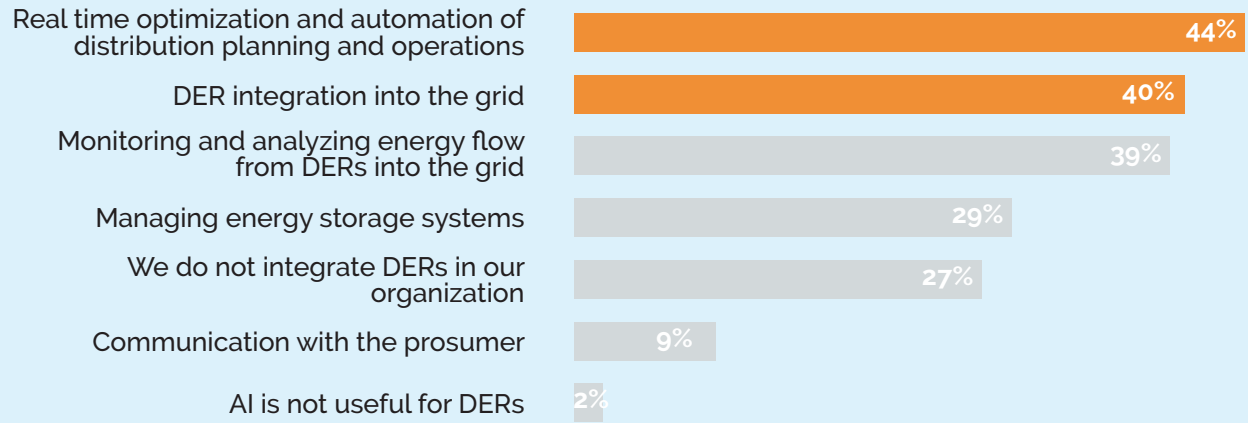
Consistent with the results in Figure 12, 45% of respondents only moderately agree that AI/ML enhances overall safety and security while only 18% strongly agree that AI/ML enhances overall safety and security (Figure 14).

AI and DERs

Utilities are generally concerned about successful integration of distributed energy resources into the grid and achieving resilience and reliability while providing optimal customer engagement services. However, DERs are often unpredictable and fluctuate with weather conditions, which makes them an unreliable source of energy. AI tools offer solutions for faster DER integration while meeting resilience and reliability objectives. 44% of utilities said that AI is valuable in providing real-time optimization and automation of distribution planning operations. 40% said it is valuable for DER integration into the grid. 39% said it brings value by monitoring and analyzing energy flow from DERs into the grid (Figure 15).

Figure 15

AI and distributed energy resources (DERs) integration and management:



Demographics

What type of utility?

Investor-owned utility	27.93%
Public-owned utility	43.24%
Cooperative	16.22%
District/federal	10.81%
Other (please specify)	1.80%

Which services does your utility provide? (Select all that apply)

Electric	72.17%
Water	39.13%
Gas	22.61%
Wastewater	16.52%
Other (please specify)	5.22%
Solid waste	4.35%

What region(s) does your utility serve? (Select all that apply)

Northeast (CT, ME, MA, NH, RI, VT, NJ, NY, PA, DE, MD, WV, DC)	12.17%
Southeast (FL, GA, MD, NC, SC, VA, AL, KY, MS, TN, AR, LA)	20.87%
Midwest (IL, IN, MI, OH, WI, IA, KS, MN, MO, NE, ND, SD)	27.83%
Southwest (AZ, CO, ID, MT, NV, NM, UT, WY, OK, TX)	22.61%
West (AK, CA, HI, OR, WA)	9.57%
International (Canada)	6.96%
International (other)	6.96%

What is the size of your utility by number of customer accounts?

2,000,000+	16.52%
1,000,001—2,000,000	12.17%
500,001—1,000,000	12.17%
200,001—500,000	13.91%
100,001—200,000	9.57%
50,001—100,000	11.30%
25,001—50,000	9.57%
Fewer than 25,000	14.78%

What is your organization's annual revenue? (In US Dollars)

Over $1 billion	30.97%
$500 million - $1 billion	15.93%
$100 - $500 million	25.66%
Below $100 million	27.43%

What is your primary role within your organization?

Engineering	25.22%
Operations	23.48%
Maintenance	2.61%
Markets/Forecasting	0.87%
IT	13.04%
Customer service	6.96%
Executive	15.65%
Finance	2.61%
Innovation/Emerging Tech.	4.35%
Marketing	2.61%
Other (please specify)	2.61%

What is your level of job responsibility in your organization?

Executive/C-Level	14.78%
Director	11.30%
Management	44.35%
Professional Staff	26.96%
Administrative	1.74%
Other (please specify)	0.87%

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Conclusion

Utilities are interested in AI but are still hesitant about leveraging AI/ML tools at their full capacity. In a sense this means expectations of artificial intelligence are set reasonably, which is important to implement the technology safely and successfully. However, AI is still shrouded with mystery and attempts to implement AI/ML tools are often faced with many challenges and hurdles. Cost is a big concern in addition to legacy applications compatibility and having in-house capabilities to manage AI/ML applications utilities. Another big issue is data availability and quality.

Artificial intelligence tools offer a solution to many of the issues that utilities aim to address like accuracy, reliability, resilience, safety, grid balance and customer satisfaction, and they are a big part of the digital transformation that the grid is undergoing. A proactive and optimized customer service is the area where AI could bring the most value for utilities. Also, cybersecurity at any organization is fortified with the right implementation of the right AI tools. And while security concerns about AI are legitimate, cloud technology is now further advanced than ever before and could offer customized solutions to each organization's needs to mitigate the risk of cyberattacks. When it comes to artificial intelligence utilities need to demystify this technology to both its customers and employees in order to achieve fully successful digitalization.

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